



Enabling Grids for E-scienceE

Training and Induction

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A view of Web Services

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www.eu-egee.org



- **Web Services are the latest method of building distributed systems**
 - Are they a breakthrough?
 - Are they significant?
 - Are they complete?
 - Are they ready?
- **Why are Distributed Systems Hard to Build?**
- **Service oriented architectures & web services**
- **Web Services & Standards**
- **Socio-economic caveats**
- **Conclusions**

- **They are necessary to our modern way of life**
 - telephone, airline booking, internet, web, financial trading
- **Global, always on, single-purpose systems**
 - Hard to build, finance and manage
- **Global, always on, multi-purpose systems**
 - Never been done – can it be done?
- **Challenges and Goals**
 - Cannot be completely met and satisfied

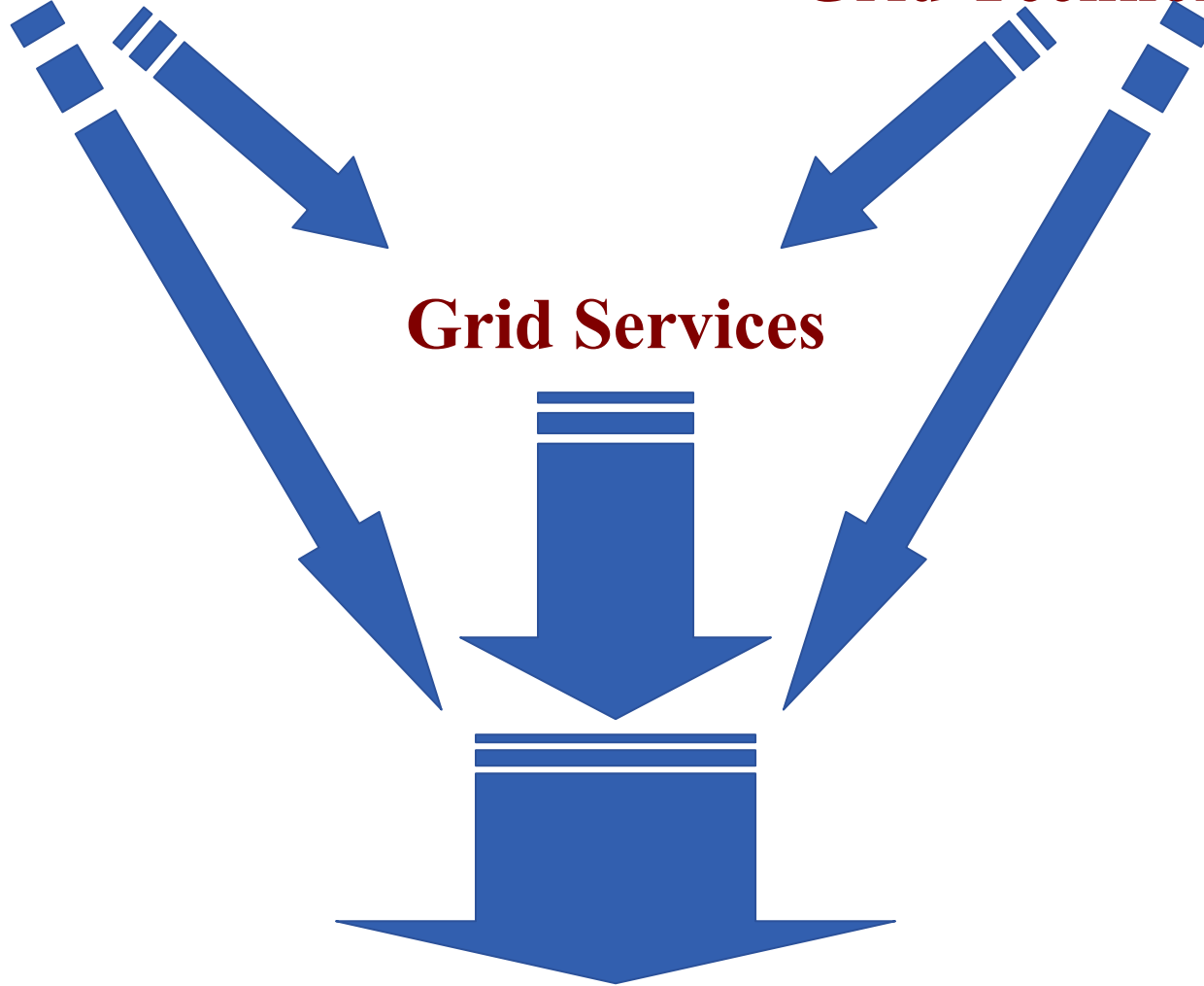
- **Challenge**
 - **Heterogeneity & Variety**
 - **Complex platform behaviour**
 - **Partial failures**
 - **Partial failures + large tasks**
 - **Autonomy – owner’s rights**
 - **Independent provision**
 - **Scale, costs & latency**
 - **Vulnerable to misuse**
 - **Diverse & evolving requirements**
 - **Valuable assets: equipment, teams, data, algorithms, working practices**
- **Goal**
 - **Simple operational model**
 - **Simple application model**
 - **Simple user model**
 - **Minimal resource wastage**
 - **Stability & uniformity**
 - **Simple resource access**
 - **Good performance**
 - **Dependable protection**
 - **Accommodation of new requirements**
 - **IPR & assets well protected**

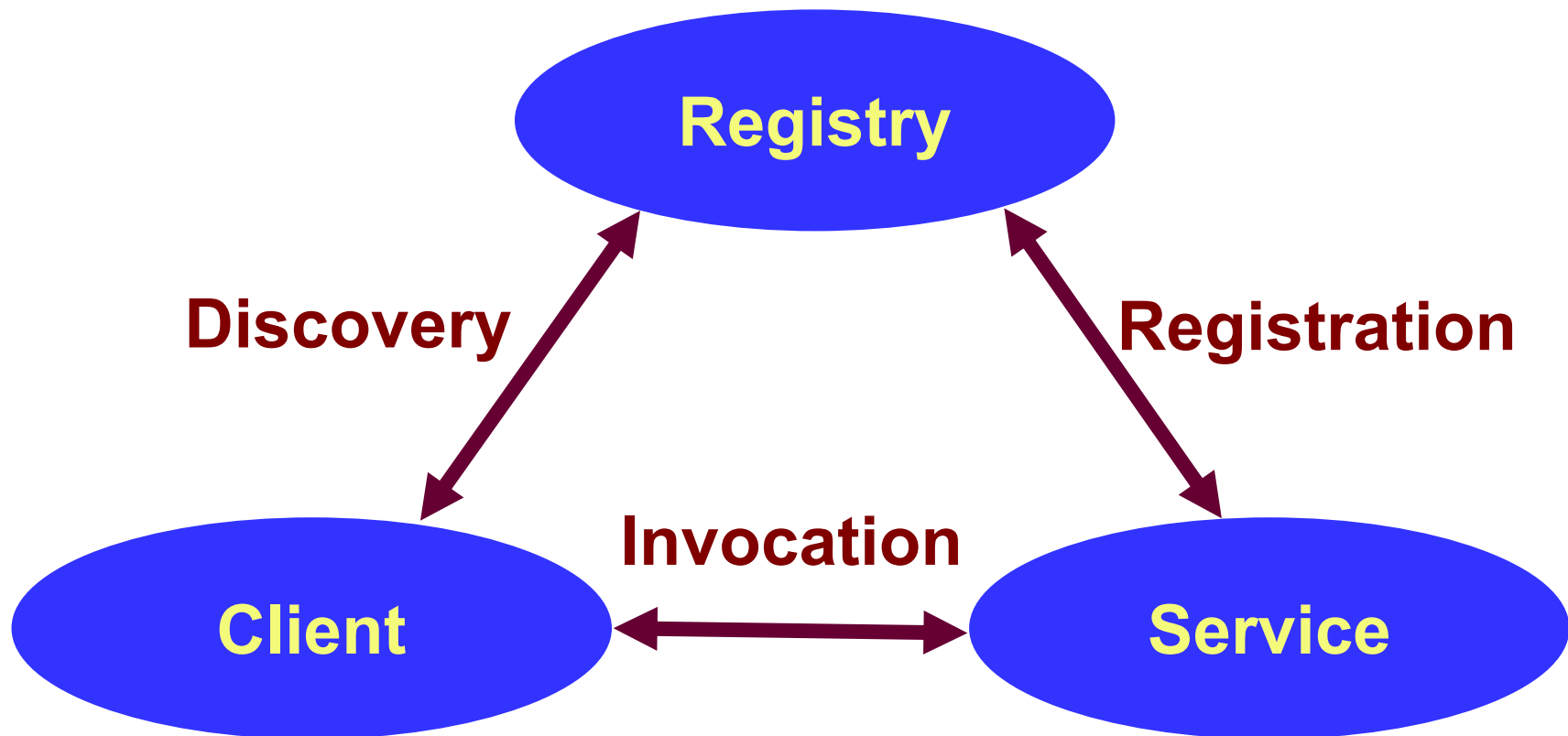
Web services provide decoupling – a useful step towards some of these

Web Services

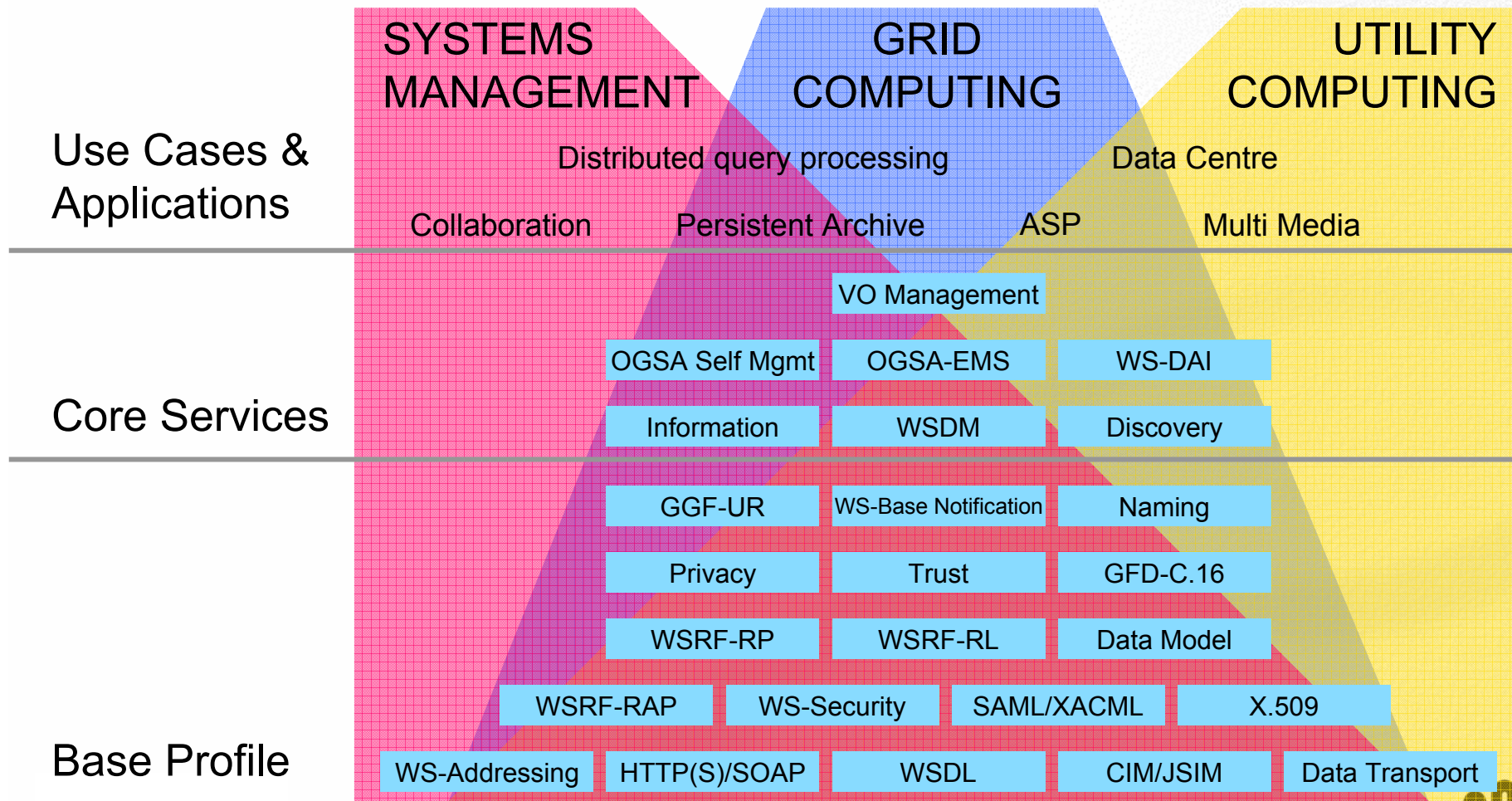
Grid Technology

Grid Services





Architecture Overview



QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

GRID Computing, Distributed Computing and Utility Computing are different views of the same **important** problem domain.



Status Legend

Standard

- Existing, adopted specification from a recognized Standards Development Organization.

Evolving

- Emerging specifications with reference implementations and standardization in process

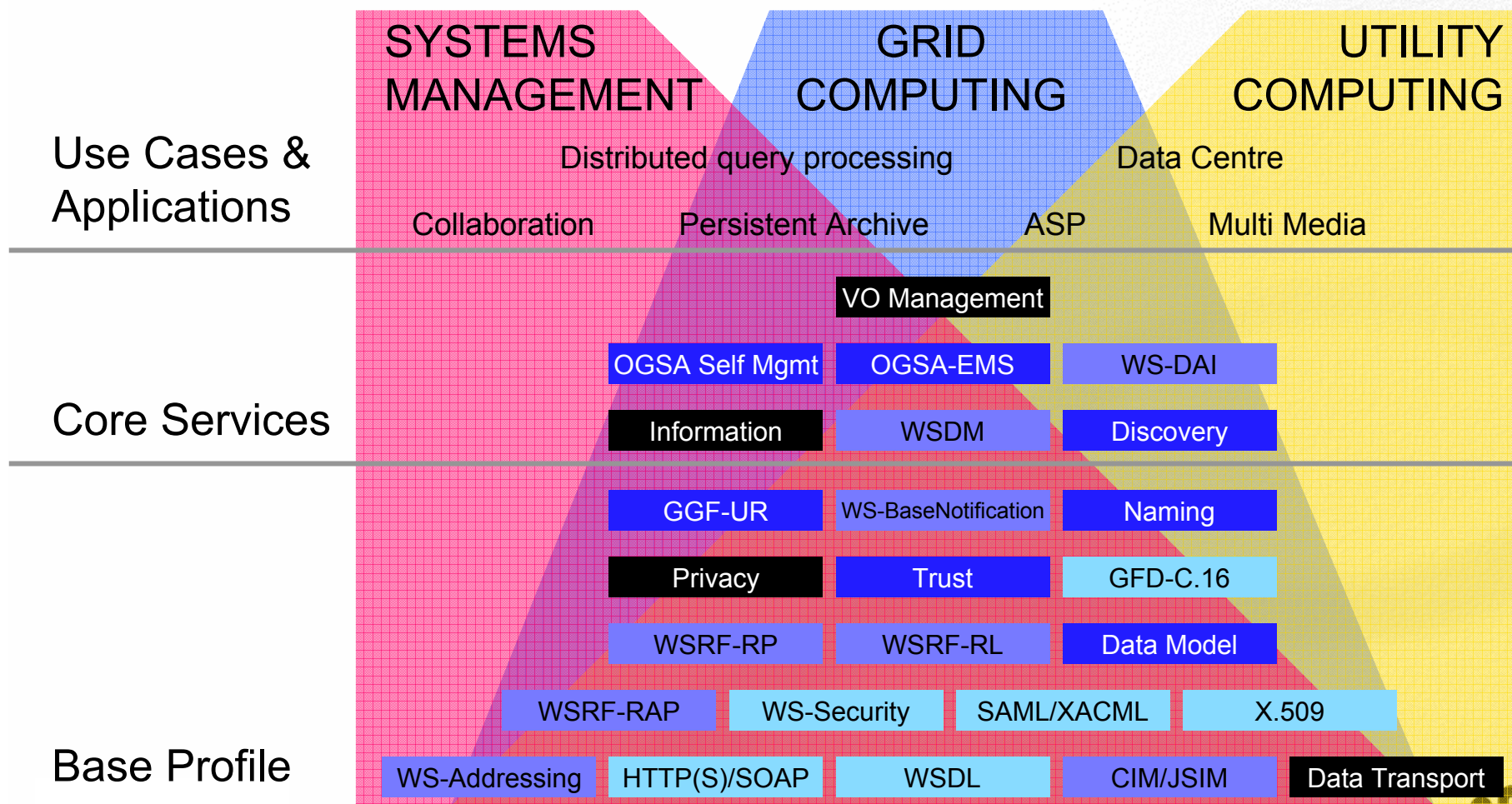
Gap

- Identified architectural component with no existing specifications complete, but work is in progress somewhere.

Hole

- Identified architectural component without apparent activity.

Architecture: Status



QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Hole
Gap
Evolving
Standard



WSRF/WSN/WSDM: Status

+ WSRF

- Resource Properties and Lifetime ready for Committee Draft.
- Service Group in process
- Renewable References moved out of scope

+ WSN

- Base Notification stable & seeking synergy with WS-Eventing
- Includes “pull” based Notification

+ WSDM

- Committee Draft
 - (Based of a different version of WSRF than the CD)

+ HP/Globus/Apache Announcement

- Apollo, Hermes, Muse incubators

<http://wiki.apache.org/incubator/<name>Proposal>

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.



JSDL: Status

+ Job Submission Description Language

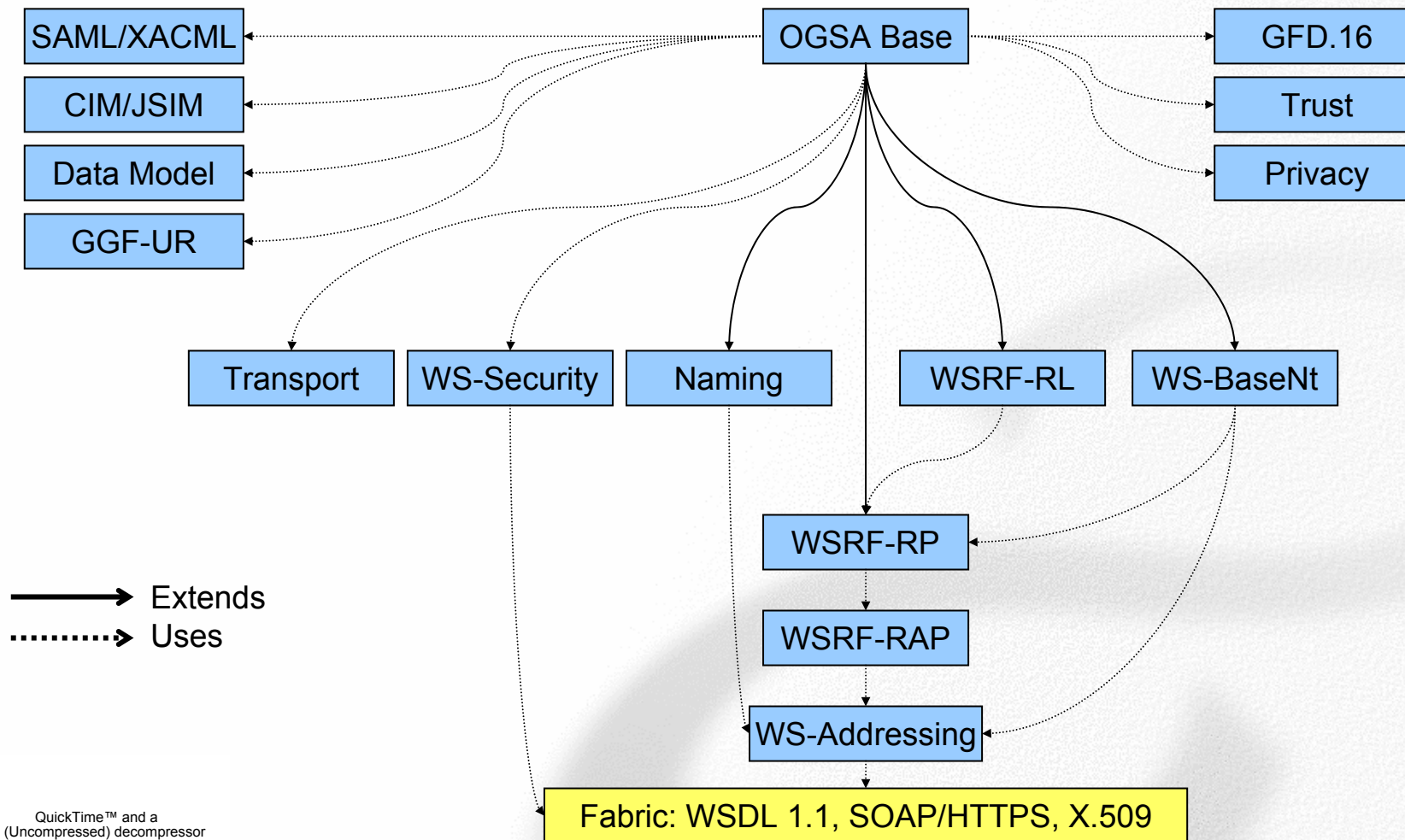
- Pre-stage, Execute, Post-stage.
- Uniformity across batch subsystems.
- Support for multiple file transfer protocols.

+ Not a Job Management Interface

+ Capabilities

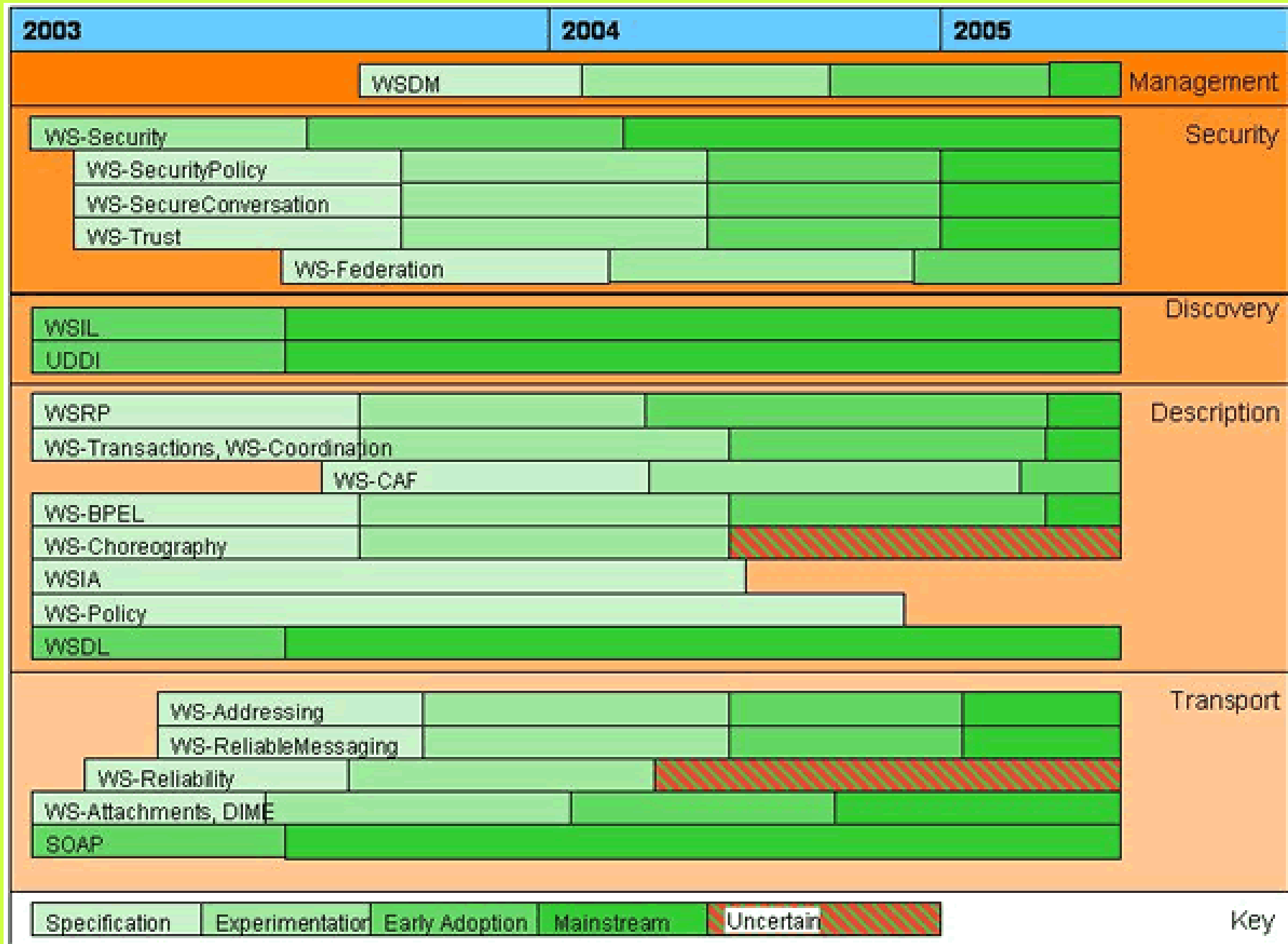
- Optional data sources/sinks, with different credentials possible
- Seamless or restricted resource description
- Suitable for resource brokers and schedulers too.

OGSA Base Profile



QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

- OASIS is a member-led, international nonprofit standards consortium concentrating on structured information and global e-business standards
- Founded in 1993, ~65 projects, staff on 3 continents
- Members of OASIS are
 - Vendors, users, academics and governments
 - Organizations, individuals and industry groups
- Best known for e-business standards that address real world business requirements, including
 - **UDDI**
 - **WS-Security**
 - **SPML**
 - **SAML**
 - **WSRP**
 - **XACML**
 - **ebXML**
 - **WS-Reliability**
 - **UBL**
- Host for key grid standards projects including
 - **WSDM**
 - **WSRF**
 - **WS-N**



From *OGSA Status and Future*, Hiro Kishimoto and Ian Foster, GGF12
 slide originally from Michael Behrens, DISA consultant

Web Services

- **Goals**
 - Computational presentation & access of Enterprise services
 - Marketing integrated large scale software and systems
 - Model for independent development
 - Model for independent operation

Grid Services

- **Goals**
 - Inter-organisational collaboration
 - Sharing information and resources
 - Framework for collaborative development
 - Framework for collaborative operation

Web Services

- **Commitment**
 - Most large technology providers
 - Some service providers
 - Some service hosters
- **Standardisation**
 - W3C
 - Oasis
 - ...

Grid Services

- **Commitment**
 - Some large laboratories
 - Many government-funded research programmes
 - Some resource providers
- **Standardisation**
 - GGF
 - Oasis

Web Services

- **Standards**
 - WS-I
 - Core of agreed & provided
 - WSDL, SOAP, UDDI, WS-security
 - Revised regularly
 - Many others under way
 - WS-* are important
 - Competition & synthesis
 - Commercial battleground
 - Do these standards support my business model
 - When do I want them
 - Hard to understand & engage

Grid Services

- **Standards**
 - None
 - Many exist as proposals
 - Continuum from requirements & research to well specified standards proposals
 - Building on & influencing WS
 - Significant effort required to understand and engage
 - Transfer OGSI to WS-Resource Framework & WS-Notification

Web Services

- **Usage**
 - Complex services created & delivered persistently by owner organisation
 - Client interactions short-lived
 - Multi-organisation integration responsibility of client
 - Workflow enactment
 - Transaction coordination
 - May be by an intermediate service
 - Security on a local basis

Grid Services

- **Usage**
 - All of WS patterns +
 - Dynamic services / resources
 - Long-lived interactions
 - Persistent computational integration
 - Data management
 - Computation management
 - Persistent operational infrastructures
 - GOC managing European-scale grid
 - System organised optimisation
 - End-to-end security (goal)
 - Virtual Organisations
 - Establish multi-organisation security policies

Web Services

- **Status**
 - Commercially successful operational applications
 - Several good toolsets available
 - Mostly costly to use outside academia
 - Workflow enactment
 - BPEL4WS
 - Beware hype and marketing
 - Scale, usability & reliability problems in free-ware
 - Many fixes were needed to Apache Tomcat
 - Much momentum
 - Very high levels of investment

Grid Services

- **Status**
 - Operational research projects and grids
 - >100 projects use GT2 or GT3
 - No toolsets
 - Scientific workflow
 - High-level work-load generators
 - Chimera, Pegasus, VDT, ...
 - Some very robust and well tested technologies
 - Condor, GT2, VDT, GT3.2, LCG2, EGEE1
 - All free-ware
 - Performance, usability and reliability problems
 - Much momentum
 - High levels of investment

Web Services

- **Interaction**
 - Grids will influence provision systems
 - Grids stimulating many standards development

Grid Services

- **Interaction**
 - Using web services extensively
 - Balancing act
 - Reach goals
 - Retain access to WS tools
 - Expect a continuous co-evolution
 - Significant new species next year

Application goals push technical limits in both cases

At limits expect difficulties
– most work should not be near limits

Comments and Questions Please